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SOME ENDF-102 FORMAT TOPICS

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List of Topics

- Consistency of Files 2, 3 and 4
- Threshold Behavior of Legendre Moments
- Consistency of Q-values and Angular Distributions with Doppler-Broadened Thresholds.
- Evaluations with Unresolved but no Resolved Resonances.

Overview

- The purpose of these slides is to *list* some points which need clarification in ENDF-102, not to *fix* them.
- Their resolution should (hopefully) be by *agreement* among the processing-code authors who wish to participate and the CSEWG Formats Committee rather than on an ad hoc individual-code basis.
- The intent is to provide *unambiguous* specifications for processing the ENDF data, not to *dictate* how any particular processing code should actually be written.
- This would *facilitate* uniformity among the processing codes, and reduce *inadvertent non-uniformity* ascribable to ambiguous specifications in the Manual.

Consistency of Files 2, 3 and 4

- ENDF-102 says (in File 4) "The energy range for which the angular distributions are given must correspond exactly with the range given in File 3 for the same reaction channel (i.e. the same MT number).
- The new F19 R-Matrix Limited evaluation does not adhere to this rule, specifically the first and second inelastic levels in the RRR.
- This suggests a Manual update for the RML format (LRF=7) to augment its specification of threshold reactions (inelastic and charged–particle) in File 2. The intent would be to specify explicitly how the File 2 cross sections are to be associated with File 4 angular distributions.
- Suggested: Review the present manual sections on the Blatt-Biedenharn angular distributions so they are consistent with the above.

Threshold Behavior of Legendre Moments

- The R-Matrix Limited Format (LRF=7) allows the specification of threshold reactions (inelastic and charged–particle) in File 2. The intent of a review would be to help evaluators specify how the Legendre coefficients for the exit particles behave near threshold.
- The complication introduced by RML is that the exit channel orbital angular momentum (L') can be different from the incident value L, and influence the "low-energy" shape of the exit angular distribution.
- The Blatt-Biedenharn discussion on angular distributions should be reviewed and if possible, simplified.
- Some discussion should be provided on how to specify the threshold behavior of elastic moments in general. A coarse mesh with linear interpolation can affect the accuracy of thermal reactor calculations. Is there a sound basis for the manual's instruction to limit the number of energy points?

Consistency of Q-values and Angular Distributions with Doppler-Broadened Thresholds

- ENDF provides Q-values for inelastic cross sections which are uniquely related to the reaction thresholds at zero degrees Kelvin. Transport codes expect consistency between those Q-values, the reaction thresholds, and the thresholds for the associated angular distribution data in File 4.
- Doppler broadening lowers the thresholds at temperatures above zero degrees, requiring that some attention be paid to the Q-value and angular-distributions to avoid "holes" in the data.
- NJOY broadens up to the top of the RRR or to the first threshold. For RML this presents a conflict which it is the evaluators' job to resolve, not the processing code's. A review of the procedures is indicated, including the fact that NJOY can broaden through a threshold if asked to.

Evaluations with Unresolved but no Resolved Resonances

- ENDF-102 implicitly assumes that unresolved resonances will always be "preceded" by resolved resonances, and NJOY understandably assumed that also. So recent evaluations with a URR but no RRR abort.
- This has been rectified in recent NJOY versions, but that still leaves an unknown number of in-house codes which abort because they assumed the same thing.
- The purpose of this slide is to point out that a simple fix has worked in the cases we used it on: insert a narrow fictitious RRR just below the URR, say 1 eV wide, and insert one very small resolved resonance, say GN=1E-6, GG=GF=0.0. If your in-house code can handle it, put the resonance outside of the fake RRR. NJOY can still handle it.
- Question: will the new NJOY "fix" adversely affect downstream codes?